

## General overview of phycological research on Hungarian rivers between 1988 and 1997

J. Padisák\*

*Balaton Limnological Institute, Hungarian Academy of Science, H-8237 Tihany, Hungary*

(\*e-mail: padisak@tres.blki.hu)

*Key words:* Hungary, phytoplankton, Danube, literature review



\* Map of Hungary with main watercourses

### Abstract

During the last decade numerous papers were published about phycological research in Hungarian rivers and related waters or wetlands. This summary provides a full list of these 76 publications, many in local journals, that may be useful for phycologists working on similar topics in other countries.

### Résumé

De nombreux articles portant sur la recherche algale dans les cours d'eau et dans les zones humides de Hongrie ont été publiés durant ces dix dernières années. Les activités de surveillance de la qualité de cours d'eau ont déjà fait l'objet d'une publication (Padisák et al., 1991); le présent article vise à fournir une liste complète des 76 publications portant sur la recherche algale en Hongrie. Mis à part des articles

portant sur les aspects méthodologiques et théoriques, la systématique, la phycogéographie et la floristique, l'essentiel des travaux publiés a porté sur le Danube. Le phytoplancton du Danube est étudié depuis plusieurs dizaines d'années de même que l'eutrophisation, conséquence de la charge en nutriments et de la construction d'une série de barrages sur le cours amont du fleuve. De nombreuses études ont été menées sur la composition floristique, la colonisation, l'émigration et l'immigration d'espèces, et sur l'évolution saisonnière du périphyton. Des investigations algologiques ont été réalisées sur les affluents et les bras-morts du Danube, notamment dans trois secteurs: la région de Szigetköz au nord de la Hongrie, la région de Budapest et la réserve naturelle de Gemenc au sud du pays. Les autres cours d'eau ont fait l'objet de moins d'attention de la part des scientifiques. Le phytoplancton de la rivière Tisza a été régulièrement étudié à Szolnok. Les algues ont été étudiées sur l'ensemble du cours de la rivière Zagyva. Une étude complète de la rivière Maros a fait l'objet d'une monographie incluant un chapitre sur les algues. Seules quelques études sur les algues de cours d'eau en Hongrie ont été publiées.

## Introduction

Phycological research on running waters in Hungary has a long history. During the past 10 years, scientific research covered many aspects of phycology such as taxonomy, floristics and ecology. Because of its importance, most studies were carried out in the Danube and many others concerned the dead-arms and backwaters. The aim of this paper is to summarize the phycological research in Hungary during the past decade and to provide a full list of publications, many of them published in local journals, that may be useful for phycologists dealing with similar topics elsewhere.

## Methodology, papers of general importance

The diatom collection of the amateur diatomologist László Vida (1932-1985) was donated to the Botanical Department of the Hungarian Natural History Museum. It consists of 439 permanent slides mostly from Hungary, but also from Czechoslovakia, Yugoslavia, Romania, Bulgaria and Norway (Buczko, 1988). Biographies and publication lists of Tibor Hortobágyi (1912-1990), Gábor Szemes (1907-1993) and István Kiss (1910-1990) are available in papers made up in commemoration of these scientists (Padisák & Hegewald, 1992; Padisák et al., 1993; Kiss, 1995). A short biography of the famous diatomologist József Pantocsek (1846-1916) has also been published (Ács, 1996).

Methodological studies have concerned periphyton (Ács & Kiss, 1991a) and the phytoplankton sampling procedures (Kiss et al., 1995a, b) in large rivers. Chlorophyll-biomass relationships of data deriving from turbid shallow lakes (Vörös & Padisák, 1991) probably apply to rivers better than relationships from clear water lakes, because phytoplankton dynamics, species composition and disturbance regime in rivers and turbulent, turbid shallow lakes can be quite similar (Reynolds et al., 1994; Padisák, 1994). Schmidt and Kiss (1989) reported on teratological forms of diatoms and green algae. The river water quality monitoring activity in Hungary was summarized (Padisák et al., 1991) and a review about the use of algae in monitoring water quality was also published (Padisák, 1993).

## Taxonomy, phycogeography, floristics

Taxonomic, morphological and ecological studies have mostly concerned centric diatoms, namely *Actinocyclus normanii* (Kiss et al., 1990), *Cyclotella atomus* (Genkal & Kiss, 1993), *C. caspia* (Kiss et al., 1988), *C. tripartita* (Scheffler & Padisák, 1997a, b), *Skeletonema potamos* (Kiss et al., 1994), *Stephanodiscus invisitatus* (Kiss, 1988; Genkal & Kiss, 1991) and chlorococcalean algae (Schmidt, 1992; Schmidt et al., 1994). Schmidt et al. (1990) reported on the occurrence of *Goniostomum latum*, while Kiss and Kristiansen (1994) dealt with the silica-scaled flagellate flora and Németh (1996b) with new and interesting algae from different groups. Detailed floristic papers on centric diatoms were published by Kiss and Nausch (1988) and Kiss and Padisák (1990).

## Danube research

### Main stream

The Danube's phytoplankton is dominated by centric diatoms and chlorococcalean algae. This explained most of the taxonomic studies mentioned above. The population dynamics of the summer centric diatom, *Skeletonema potamos*, was described based on daily investigations (Kiss et al., 1994). An interesting diurnal cyclicity in phytoplankton numbers and chlorophyll *a* was explained by growth conditions and discharge (Kiss, 1996). The phytoplankton of the Danube has been studied regularly for a long time and the results have been published in papers (Kiss, 1991a, 1994a; Kiss et al., 1991; Kiss & Genkal 1997; Schmidt, 1994; Németh, 1996a) dealing with phytoplankton development in individual years. An analysis (Kiss, 1991b) of the existing data demonstrated that phytoplankton numbers and biomass increased significantly during recent decades partly because of enrichment in mineral nutrients (Kiss, 1991b, 1994b) and partly as a consequence of the construction of a chain of reservoirs in the upper river. After comparison of the Danube's diatoms at Vienna and Budapest (Kiss & Nausch, 1988) a recent study has compared the phytoplankton in the Danube's reservoirs from Germany to Hungary (Kiss & Genkal, 1996). Matter and energy flow (Tamás-Dvihally, 1993), trophic interactions with bacteria (V. Balogh et al., 1994), crustacean plankton (Bothár & Kiss, 1990, 1995) and ciliates (Kiss & Csutor-Bereczky, 1990) have also been studied. An active biomonitoring technique based on *Cladophora glomerata* tests was developed to assess effect of heavy metals (Oertel, 1991, 1993).

Numerous studies carried out on periphytic algae concerned floristic composition, colonization, emigration and immigration of species and seasonal succession. Discharge proved to be a major factor affecting periphyton development (Ács & Kiss, 1991a, b, 1993a, b; Makk & Ács, 1996, 1997).

### Side-arms, backwaters

Algological investigations on the side-arms and backwaters of the Danube have been concentrated in three areas: Szigetköz in northern Hungary, the vicinity of Budapest and the Gemenc Protected Landscape Area in southern Hungary.

In connection with the construction of the "C-variant" of the Gabčíkovo power plant and the consequent unilateral diversion of the mainflow of the Danube, numerous studies have started to assess the environmental impact of the above actions. Species composition and biodiversity of both plankton and periphyton was thoroughly studied (Németh, 1989, 1990, 1996b; Buczkó & Ács, 1992, 1994) and a long-term periphyton monitoring system was developed (Buczkó & Ács, 1995; Ács & Buczkó, 1996; Buczkó et al., 1997). The effect of decreased flow velocity on phytoplankton development was studied in enclosures (Németh & Gulyás, 1990; Gulyás et al., 1991) and matter- and energy flow was also studied (Horváth & Bartalis, 1996). The effect of the Gabčíkovo reservoir on the algae are summarized in recent papers (Buczkó et al., 1997; Kiss, 1997).

In a small backwater of the Danube at Göd, population dynamics during a winter bloom of diatoms (Kiss & Genkal, 1993) and *Synura petersenii* (Kiss & Kristiansen, 1994) were described. Preliminary algological investigations were carried out in the Soroksár dead-arm near Budapest (Barreto et al., 1997).

The Gemenc Protected Landscape Area in southern Hungary supports one of the largest original gallery forests in Europe. The algal flora of dead-arms and backwaters was studied by Schmidt and Káldi-Fehér (1996) and winter phytoplankton blooms were also observed (Schmidt, 1997). An extended project (Csányi et al., 1992, 1994) aimed to assess the effect of water level fluctuations on water chemistry, phytoplankton and zooplankton.

## Other Hungarian rivers

As compared to the Danube, fewer scientific efforts have aimed to explore other Hungarian running water systems. *Scenedesmus grahneisii* (Schmidt, 1992) and, more prominently, *Goniostomum latum* (Schmidt et al., 1990), were repeatedly found in different side-arms and backwaters. The phytoplankton of R. Tisza was regularly studied at Szolnok (Kelemen, 1992) and that of R. Zagyva once only, but along the whole river section (Káldiné-Fehér, 1994). The limnology of the R. Maros was summarized in a monograph

(Hamar & Sárkány-Kiss, 1995), which contains a separate chapter on algae (Hamar, 1995). Uherkovich (1994) published about the algal flora of some small streams in southern Hungary. Apart from this study, only the Laskó stream at Egerszalók has been studied phycologically (Estók & Milinki, 1989).

## Activity of Hungarian phycologists in other countries

In the taxonomic papers mentioned above, comparative materials of many localities were used:

- for *Actinocyclus normanii* (Kiss et al., 1990) from the rivers Svratka, Vtava, Dyje (Czech Republic), Danube, Kolárovo (Slovakia), Dordogne, Fensf, Oise (France), Spree, Müggelsee (Germany), Volga and Caspean See (Russia) and
- for *Cyclotella atomus* (Genkal & Kiss, 1993) from the rivers Danube, Dnepr (Ukraine), Amur, Yenitsei, Ob, Selengga, Volga and its tributaries (Russia), and Vistula (Poland).

Material for papers about *Cyclotella tripartita* (Scheffler & Padisák, 1997a, b) was obtained exclusively from Stechlinsee, Germany, which represents a lake type (deep, oligotrophic) that is not found in Hungary.

For comparisons of the Danube phytoplankton, samples were collected in Austria, Germany and Hungary (Kiss & Nausch, 1988; Kiss & Genkal, 1996).

Uherkovich (1993) included floristic studies on the rivers Dunajec and Hnilec among small water bodies in Central Slovakia and Pajak and Kiss (1990) investigated the phytoplankton of the Vistula above and below the Goczalkowice reservoir, Poland.

## Acknowledgements

Material for this review was collected from the databank "Flora et Iconographia Algarum Hungariae" (Botanical Department, Hungarian National History Museum) and from the collection "Algological Papers from Hungary" (Hungarian Algological Society).

I thank Dr Éva Ács for her help during the preparation of the manuscript.

## References

- Ács É (1996) Dr. József Pantocsek, the diatomologist: a short review about his Hungarian activity. Slovenska spoločnosť pre dejiny vied a techniky pri SAV, Bratislava: 25-32.
- Ács É, Buczkó K (1996) The changes of relative importance value of periphytic algal taxa in Szigetköz section of River Danube (Hungary). 31. Arbeitstagung der IAD, Baja, Ungarn: 441-446.
- Ács É, Kiss KT (1991a) Neuere Methode zu den Untersuchungen des Donauperiphytons. 29. Arbeitstagung der IAD, Kiew/UdSSR, 2: 37-40.
- Ács É, Kiss KT (1991b) Investigation of periphytic algae in the Danube at Göd (1669 river km. Hungary). Arch. Hydrobiol., Algological Studies 62: 47-67.
- Ács É, Kiss KT (1993a) Effects of the water discharge on periphyton abundance and diversity in a large river (River Danube, Hungary). Hydrobiologia 249: 125-133.
- Ács É, Kiss KT (1993b) Colonization process of diatoms on artificial substrate in the River Danube near Budapest (Hungary). In: van Dam H (ed.) Twelfth International Diatom Symposium. Hydrobiologia 269/270: 307-316.
- Barreto S, Ács É, Makk J, Bugyi G, Böddi B (1997) Preliminary algological investigations in Soroksár-arm of River Danube. 32. Arbeitstagung der IAD, Wien, pp. 159-162.
- Bothár A, Kiss KT (1990) Phytoplankton and zooplankton (Cladocera, Copepoda) relationship in the eutrophicated River Danube (Danubialia Hungarica, CXI). Hydrobiologia 191: 165-171.
- Bothár A, Kiss KT (1995) Änderungen des Phyto- und Zooplanktons in der Donau bei Göd, Ungarn (1669 Strom km) zwischen 1991-1994. Opusc. Zool. Budapest 27-28: 137-146.
- Buczkó K (1988) The diatom collection of László Vida. Studia Botanica Hungarica 20: 77-94.
- Buczkó K, Ács É (1992) Preliminary studies on the periphytic algae in the branch-system of the Danube at Cikolasziget (Hungary). Studia Botanica Hungarica, 23: 49-62.
- Buczkó K, Ács É (1994) Algological studies on the periphyton in the branch-system of the Danube at Cikolasziget (Hungary). Verh. int. Verein. Limnol. 25: 1680-1683.
- Buczkó K, Ács É (1995) Algamonitoring a Szigetközben: perifitikus algák. [Algal monitoring in the Szigetköz: periphytic algae]. In: Bíró P (ed.) a XXXVII. Hidrobiológus Napok Kiadványa, ISBN 963 04 00278: 83-86. Innopress Kft, Veszprém. [in Hungarian]

- Buczko K, Rajczy M, Ács É, Papp B (1997) Signals of cryptogams. In: Láng I, Banczerowski I, Berczik Á (eds) Studies on the Environmental State of the Szigetköz after the Diversion of the Danube. MTA Szigetköz Bizottság, Budapest: 83-96.
- Csányi B, Gulyás P, Németh J (1992) Hydrobiological survey in the Gemenc Protected Landscape Area. Internat. Kommission für die Hydrologie des Rheingebietes, Arnhem, The Netherlands: 49-54.
- Csányi B, Gulyás P, Németh J (1994) A synbiological survey of the side-arms of the Gemenc Protected Landscape Area. In: Kinzelbach (ed.) Biologie der Donau Limnol. Aktuell. 2: 331-350, G. Fischer Verlag, Stuttgart, Jena.
- Estók B, Milinki E (1989) Changes in the quality of water in Laskó stream and the storage lake built on it at Egerszalók. Tiscia 24: 11-22.
- Genkal SI, Kiss KT (1991) New morphological and taxonomical data for *Stephanodiscus invisitatus* Hohn et Hellerman (Bacillariophyta). Arch. Protistenk. 140: 289-301.
- Genkal SI, Kiss KT (1993) Morphological variability of *Cyclotella atomus* Hustedt var. *atomus* and *C. atomus* var. *gracilis* var. *nov.* In: van Dam H. (ed.) Twelfth International Diatom Symposium - Hydrobiologia 269/270: 39-48.
- Gulyás P, Németh J, Csányi B (1991) Hydrobiologische Untersuchungen in den Kleinen Schüttinsel (Szigetköz). In: Scharf W (ed.) Feuchtgebiete Erhaltung, Neuanlage und Gestaltung. Aus Ökologischer, planerischer, wasserwirtschaftlicher und rechtlicher Sicht. Österreichische Gesellschaft für Natur- und Umweltschutz. Wien: 239-258.
- Hamar (1995) Algological studies of the Maros (Mures) River. In: Hamar J, Sárkány-Kiss A (eds) The Maros/Mures River Valley. A Study of the Geography, Hydrobiology and Ecology of the River and its Environment: 149-164. Tiscia Monograph Series, Szeged, Tigris Mures.
- Hamar J, Sárkány-Kiss A (1995) The Maros/Mures River Valley. A Study of the Geography, Hydrobiology and Ecology of the River and its Environment. Tiscia Monograph Series, Szeged, Tigris Mures.
- Horváth L, Bartalis É (1996) Einige Eigenartigkeiten des Stoffhaushaltes des Wassers im ungarischen Donauabschnitt und in den Gewässern der Kleinen Schüttinsel (Szigetköz). 31. Arbeitstagung der IAD: 75-80.
- Káldiné-Fehér G (1994) Fitoplankton vizsgálatok a Zagyva hossz-szelvényében [Phytoplankton studies of longitudinal profile of the R. Zagyva]. - Botanikai Közlemények 81: 129-140. [in Hungarian with German summary]
- Kelemen K (1992) Fitoplankton vizsgálatok a Tisza szolnoki szelvényében [Phytoplankton analyses in the Szolnok section of the River Tisza]. Hidrológiai Közlöny, 72: 52-57. [in Hungarian with English summary]
- Kiss KT (1988) The morphology and taxonomy of *Stephanodiscus invisitatus* Hohn & Hellermann (Bacillariophyceae). Arch. Protistenk. 135: 181-196.
- Kiss KT (1991a) Algologische Ergebnisse von zwei Längsprofiluntersuchungen an der Donau. 29. Arbeitstagung der IAD, Kiew/UdSSR, 2: 72-75.
- Kiss KT (1991b) Die quantitativen Änderungen des Phytoplanktons der Donau in der 80er Jahren im Abschnitt von Göd (Stromkm 1669). 29. Arbeitstagung der IAD, Kiew/UdSSR, 2: 68-71.
- Kiss KT (1994a) Qualitative und quantitative Planktonuntersuchungen in der Donau bei Göd/Ungarn (1669 Strkm). I. Phytoplankton. 30. Arbeitstagung der IAD, Zuoz/Schweiz: 25-28.
- Kiss KT (1994b) Trophic level and eutrophication of the river Danube in Hungary. Verh. Internat. Verein Limnol. 25: 1688-1691.
- Kiss KT (1995) In memoriam Dr. Szemes Gábor (1907-1993). Botanikai Közlemények 81: 121-127. [in Hungarian with English summary]
- Kiss KT (1996) Diurnal changes of planktonic diatoms in the River Danube near Budapest (Hungary). Algological Studies 80: 113-122.
- Kiss KT (1997) The main results of phytoplankton studies on the river Danube and its side-arm system at the Szigetköz area during the nineties (Hungary). IAD Tagung, Kurzreferaten 32: 153-158.
- Kiss KT, Ács É, Kovács A (1994) Ecological observations on *Skeletonema potamos* (Weber) Hasle in the river Danube, near Budapest (1991, 92- daily investigations). Hydrobiologia 289: 163-170.
- Kiss KT, Coste M, LeCohu R, Nausch M (1988) *Cyclotella caspia* (Bacillariophyceae) in some rivers and lakes in Europe (Morphological observations). Cryptogamie, Algologie. 9: 27-42.
- Kiss KT, Csutor-Bereczky M (1990) Untersuchung des Phytoplanktons und der Ciliatenfauna der Donau von Vilkovo bis Wien im März 1988. In: Weber E (ed.): Ergebnisse der Donauexpedition 1988. Eigenverlag der IAD. Wien. p. 163-171.
- Kiss KT, Genkal SI (1993) Winter blooms of centric diatoms in the River Danube and its side-arms. Hydrobiologia 269/270: 317-325.
- Kiss KT, Genkal SI (1996) Phytoplankton of the Danube's reservoirs in September 1995 from Germany to Hungary. IAD Tagung, Kurzreferaten 31: 143-148.
- Kiss KT, Genkal SI (1997) Télvégi-korlatvaszi *Centrales* (Bacillariophyceae) vízvirágzás a Dunán (1996) [Late winter - early spring bloom of centric diatoms in the River Danube at Göd (1996)]. - Hidrológiai Közlöny 77: 57-58. [in Hungarian with English summary]
- Kiss KT, Kristiansen J (1994) Silica-scaled chrysophytes from some rivers and shallow lakes in Hungary. Hydrobiologia 289: 157-162.
- Kiss KT, LeCohu R, Coste M, Genkal SI, Houk V (1990) *Actinocyclus normanii* (Bacillariophyceae), in some rivers and lakes in Europe. Morphological examinations and quantitative relations. Ouvrage dédié à H. Germain, Koeltz, p. 111-123.

- Kiss KT, Nausch M (1988) Comparative investigations of planktonic diatoms of section of the Danube near Vienna and Budapest. In Round FE (ed.) Proceedings 9th Internat. Diatom Symposium. Bristol. 1986: 115-122.
- Kiss KT, Padisák J (1990) Species Succession in the Thalassiosiraceae: Quantitative Studies in the Large, Shallow Lake Balaton, Hungary. In: Simmola, H. (ed.) Proceedings 10<sup>th</sup> Internat. Diatom Symposium. Joensuu. 1988. p. 481-490.
- Kiss KT, Schmidt A, Ács É (1995a) Fitoplankton-mintavétel gyakoriságának kérdése egy nagy, eutrófikus folyóvízben. In: Bíró, P. (ed.) a XXXVII. Hidrobiológus Napok Kiadványa, ISBN 963 04 00278: 79-82. Innopress Kft, Veszprém. [in Hungarian]
- Kiss KT, Schmidt A, Ács É (1995b) Sampling strategies for phytoplankton investigations in a large River (River Danube, Hungary). In: Whitton BA & Rott E (eds) Use of Algae for Monitoring Rivers II: 179-186. E. Rott, Universität Innsbruck.
- Kiss KT, Schmidt A, Bartalis ET (1991) Phytoplanktonuntersuchungen im ungarischen Donauabschnitt im Jahre 1987. 29. Arbeitstagung der IAD, Kiew/UdSSR, 2: 76-80.
- Makk J, Ács É (1996) Interaction between diatoms and bacteria in the biofilm of the Danube river. 31. Arbeitstagung der IAD, Baja - Ungarn: 109-114.
- Makk J, Ács É (1997) Investigation of epilithic biofilms in River Danube. 32. Arbeitstagung der IAD, Wien, Austria: 109-114.
- Németh J (1989) Szigetközi vízterek fitoplanktonjának kvalitatív vizsgálata [Qualitative phytoplankton investigations at Szigetköz region]. Műhely, MTA Földrajtud. Kut. Int., Környezetminősítő és Számítástechnikai Osztály Tanulmányosorozata 1: 1-19. [in Hungarian]
- Németh J (1990) Qualitative algologische Untersuchungen auf der Kleinen Schüttinsel (Szigetköz), 1983-1989. 28. Arbeitstagung der IAD, Varna/Bulgaria: 27-30.
- Németh J (1996a) Qualitative and quantitative phytoplankton investigations of the River Danube between Rajka and Budapest (1848-1659 river km) during 1994-1996. IAD Tagung, Kurzreferaten 31: 149-154.
- Németh J (1996b) New and rare algae from the Protected Landscape Area of Szigetköz (Hungary) (Neue und wenig bekannte Algen aus der Kleinen Schüttinsel (Szigetköz)). IAD Tagung, Kurzreferaten 31: 155-156.
- Németh J, Gulyás P (1990) Experimentelle Untersuchung des Eutrophierungsprozesses im Nebenarmsystem der Kleinen Schüttinsel (Szigetköz). 28. Arbeitstagung der IAD, Varna/Bulgaria p. 31-34.
- Oertel N (1991) Heavy metal accumulation in *Cladophora glomerata* (L.) Kütz. in the River Danube. Ambio 20: 264-268.
- Oertel N (1993) The applicability of *Cladophora glomerata* (L.) Kütz. in an active biomonitoring technique to monitor heavy metals in the River Danube. The Science of the Total Environment, Suppl. 2: 1293-1304.
- Padisák J (1993) Use of algae for water quality monitoring. In: Salánki J & Istvánovics V (eds) Limnological Bases of Lake Management. Proc. of the ILEC/UNEP Training Course: 73-82. Internat. Lake Environm. Committee Foundation, Shiga.
- Padisák J (1994) Identification of relevant time-scales in non-equilibrium community dynamics: conclusions from phytoplankton surveys. New Zealand J. Ecol. 18: 169-176.
- Padisák J, Ács É, Kovács K (1993) In memoriam Dr. Kiss István (1910-1990). Botanikai Közlemények, 80: 89-98. [in Hungarian with English summary]
- Padisák J, Ács É, Rajczy M, Kiss KT (1991) Use of algae for monitoring rivers in Hungary. In: Whitton BA, Rott E, Friedrich G (eds) Use of Algae for Monitoring Rivers II: 123-128. Inst. für Botanik, Univ. Innsbruck, Innsbruck.
- Padisák J, Hegewald E (1992) In memoriam Dr. h. c. Dr. Hortobágyi Tibor (1912-1990). Botanikai Közlemények, 79: 99-120. [in Hungarian with English summary]
- Pajak G, Kiss KT (1990) Seasonal changes of phytoplankton in the River Vistula above and below the Goczałkowice Reservoir (southern Poland). Acta Hydrobiol. 32: 101-114.
- Reynolds C S, Descy J-P, Padisák J (1994) Are phytoplankton dynamics in rivers so different from those in shallow lakes? Hydrobiologia 249: 1-8.
- Scheffler W, Padisák J (1997a) *Cyclotella tripartita* Håkansson (Bacillariophyceae), a dominant diatom species in the oligotrophic Stechlinsee (Germany). Nova Hedwigia 65: 221-232.
- Scheffler W, Padisák J (1997b) *Cyclotella tripartita*, eine für Deutschland neue Diatomee des Planktons. DGL Tagungsbericht 1996 (Schwedt), Krefeld 1997: 342-346.
- Schmidt A (1992) A second discovery of *Scenedesmus grahnensis* (Heinig) Fott in Hungary. Tiscia 26: 63-65.
- Schmidt A (1994) Main characteristics of the phytoplankton of the Southern Hungarian section of the River Danube. Hydrobiologia 289: 97-108.
- Schmidt A (1997) Algenmassenproduktion unter der Eisdecke in einigen Seiten- und Altarmen der Donau. IAD Tagung, Kurzreferaten 32: 137-140.
- Schmidt A, Káldi-Fehér G (1996) Algologische Untersuchungen auf dem Überschwemmungsgebiet der Donau bei Baja/Südungarn. IAD Tagung, Kurzreferaten 31: 457-462.
- Schmidt A, Kiss KT (1989) Algarendellenességek felszíni vizeinkből (Teratologic algal forms from the surface waters). Botanikai Közlemények 76: 107-123. [in Hungarian with English summary]
- Schmidt A, Kiss KT, Bartalis É (1994) Chlorococcal algae in the phytoplankton of the Hungarian section of River Danube in the early nineties. Biológia Bratislava 49: 553-562.

- Schmidt A, Vasas F, Dobler L (1990) Adatok a *Gonyostomum latum* Ivanov magyarországi előfordulásáról. (Data on the presence of *Gonyostomum latum* Ivanov in Hungary). Botanikai Közlemények 77/1-2: 39-46. [in Hungarian with English summary]
- Tamás-Dvihally Z (1993) Zum Stoffhaushalt der mittleren Donau. Arch. Hydrobiol. Suppl. 101, Large Rivers 9. 1: 53-72.
- Uherkovich G (1993) Beiträge zur algologischen Kenntnis einiger Gewässer der Zentralslowakei. Biologia, Bratislava 48/1: 3-6.
- Uherkovich G (1994) Adatok Dél-Dunántúl néhány kisebb vize algavegetációjának ismeretéhez. [Data to the algal vegetation of some small waters of Southern Transdanubia.] - Somogyi Múzeumok Közleményei 10: 145-150. [in Hungarian]
- V-Balogh K, Bothár A, Kiss KT, Vörös L (1994) Bacterio-, phyto - and zooplankton of the River Danube (Hungary). Verh. Internat. Verein. Limnol. 25: 1692-1994.
- Vörös L, Padisák J (1991) Phytoplankton biomass and chlorophyll-*a* in some shallow lakes in Central Europe. Hydrobiologia 215: 111-119.